UCRL-JC-120836 Abs

25th Annual Anomalous Absorption Conference
Aspen, Colorado
May 27 – June 1, 1995

Laser Absorption, Plasma Evolution, and X-Ray Emission in Solid Targets Heated by Femtosecond Lasers*

R. S. Walling, R. M. More, W. E. Alley, M. E. Foord, A. L. Osterheld

Lawrence Livermore National Laboratory, P.O. Box 808, Livermore, CA 94550

We use the hydrodynamics code LASNEX to simulate the absorption of 100-fs laser pulses on solid density targets. In these simulations, laser absorption occurs by means of inverse bremsstrahlung using a 1D Helmholtz wave equation solved self-consistently with the plasma evolution. During the laser absorption, several processes affect the amount of laser absorption. In the intensity regime from 10^{13} W/cm^2 to 10^{18} W/cm^2, these processes include: (1) laser absorption processes, (2) hydrodynamics, (3) heat conduction, (4) ion-electron equilibration, and (5) separate electron and ion equations of state. We correct for the Gaussian spatial profile of the laser, use a pulse shape derived from autocorrelation measurement, and find excellent agreement with recent LLNL experiments for aluminum targets. We examine briefly questions related to ponderomotive steeping of the density profile, changes in plasma evolution due to laser pulse shape, and time-duration of x-ray emission.

*Work performed under the auspices of the U.S. Dept. of Energy by the Lawrence Livermore National Laboratory under Contract No. W-7405-Eng-48.